Spring is the most popular application development framework for enterprise Java. Millions of developers around the world use Spring Framework to create high performing, easily testable, and reusable code.

Dependency Injection (DI)

The technology that Spring is most identified with is the **Dependency Injection (DI)** flavor of Inversion of Control. The **Inversion of Control (IoC)** is a general concept, and it can be expressed in many different ways. Dependency Injection is merely one concrete example of Inversion of Control.

When writing a complex Java application, application classes should be as independent as possible of other Java classes to increase the possibility to reuse these classes and to test them independently of other classes while unit testing. Dependency Injection helps in gluing these classes together and at the same time keeping them independent.

What is dependency injection exactly? Let's look at these two words separately. Here the dependency part translates into an association between two classes. For example, class A is dependent of class B. Now, let's look at the second part, injection. All this means is, class B will get injected into class A by the IoC.

Dependency injection can happen in the way of passing parameters to the constructor or by post-construction using setter methods. As Dependency Injection is the heart of Spring Framework, we will explain this concept in a separate chapter with relevant example.

Aspect Oriented Programming (AOP)

One of the key components of Spring is the **Aspect Oriented Programming (AOP)** framework. The functions that span multiple points of an application are called **cross-cutting concerns** and these cross-cutting concerns are conceptually separate from the application's business logic. There are various common good examples of aspects including logging, declarative transactions, security, caching, etc.

The key unit of modularity in OOP is the class, whereas in AOP the unit of modularity is the aspect. DI helps you decouple your application objects from each other, while AOP helps you decouple cross-cutting concerns from the objects that they affect.

The AOP module of Spring Framework provides an aspect-oriented programming implementation allowing you to define method-interceptors and pointcuts to cleanly decouple code that implements functionality that should be separated. We will discuss more about Spring AOP concepts in a separate chapter.

The Spring Framework provides about 20 modules which can be used based on an application requirement.



## Core Container

The Core Container consists of the Core, Beans, Context, and Expression Language modules the details of which are as follows −

* The **Core** module provides the fundamental parts of the framework, including the IoC and Dependency Injection features.
* The **Bean** module provides BeanFactory, which is a sophisticated implementation of the factory pattern.
* The **Context** module builds on the solid base provided by the Core and Beans modules and it is a medium to access any objects defined and configured. The ApplicationContext interface is the focal point of the Context module.
* The **SpEL** module provides a powerful expression language for querying and manipulating an object graph at runtime.

## Data Access/Integration

The Data Access/Integration layer consists of the JDBC, ORM, OXM, JMS and Transaction modules whose detail is as follows −

* The **JDBC** module provides a JDBC-abstraction layer that removes the need for tedious JDBC related coding.
* The **ORM** module provides integration layers for popular object-relational mapping APIs, including JPA, JDO, Hibernate, and iBatis.
* The **OXM** module provides an abstraction layer that supports Object/XML mapping implementations for JAXB, Castor, XMLBeans, JiBX and XStream.
* The Java Messaging Service **JMS** module contains features for producing and consuming messages.
* The **Transaction** module supports programmatic and declarative transaction management for classes that implement special interfaces and for all your POJOs.

## Web

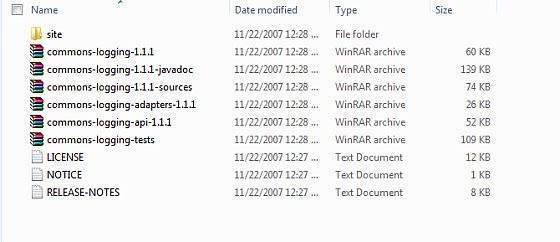
The Web layer consists of the Web, Web-MVC, Web-Socket, and Web-Portlet modules the details of which are as follows −

* The **Web** module provides basic web-oriented integration features such as multipart file-upload functionality and the initialization of the IoC container using servlet listeners and a web-oriented application context.
* The **Web-MVC** module contains Spring's Model-View-Controller (MVC) implementation for web applications.
* The **Web-Socket** module provides support for WebSocket-based, two-way communication between the client and the server in web applications.
* The **Web-Portlet** module provides the MVC implementation to be used in a portlet environment and mirrors the functionality of Web-Servlet module.

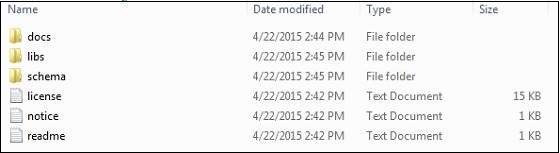
## Miscellaneous

There are few other important modules like AOP, Aspects, Instrumentation, Web and Test modules the details of which are as follows −

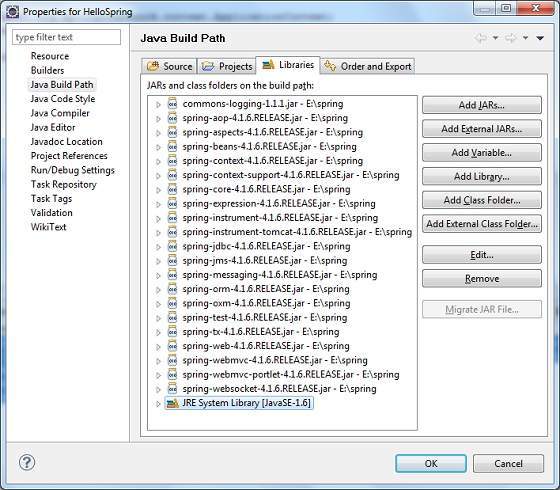
* The **AOP** module provides an aspect-oriented programming implementation allowing you to define method-interceptors and pointcuts to cleanly decouple code that implements functionality that should be separated.
* The **Aspects** module provides integration with AspectJ, which is again a powerful and mature AOP framework.
* The **Instrumentation** module provides class instrumentation support and class loader implementations to be used in certain application servers.
* The **Messaging** module provides support for STOMP as the WebSocket sub-protocol to use in applications. It also supports an annotation programming model for routing and processing STOMP messages from WebSocket clients.
* The **Test** module supports the testing of Spring components with JUnit or TestNG frameworks.



https://commons.apache.org/logging/download\_logging.cgi



https://repo.spring.io/release/org/springframework/spring



Now use **Add External JARs** button available under the **Libraries** tab to add the following core JARs from Spring Framework and Common Logging installation directories −

* commons-logging-1.1.1
* spring-aop-4.1.6.RELEASE
* spring-aspects-4.1.6.RELEASE
* spring-beans-4.1.6.RELEASE
* spring-context-4.1.6.RELEASE
* spring-context-support-4.1.6.RELEASE
* spring-core-4.1.6.RELEASE
* spring-expression-4.1.6.RELEASE
* spring-instrument-4.1.6.RELEASE
* spring-instrument-tomcat-4.1.6.RELEASE
* spring-jdbc-4.1.6.RELEASE
* spring-jms-4.1.6.RELEASE
* spring-messaging-4.1.6.RELEASE
* spring-orm-4.1.6.RELEASE
* spring-oxm-4.1.6.RELEASE
* spring-test-4.1.6.RELEASE
* spring-tx-4.1.6.RELEASE
* spring-web-4.1.6.RELEASE
* spring-webmvc-4.1.6.RELEASE
* spring-webmvc-portlet-4.1.6.RELEASE
* spring-websocket-4.1.6.RELEASE

HelloWorld Project

Here is the content of **HelloWorld.java** file −

package com.tv;

public class HelloWorld {

private String message;

public void setMessage(String message){

this.message = message;

}

public void getMessage(){

System.out.println("Your Message : " + message);

}

}

Following is the content of the second file **MainApp.java** −

package com.tv;

import org.springframework.context.ApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class MainApp {

public static void main(String[] args) {

ApplicationContext context = new ClassPathXmlApplicationContext("Beans.xml");

HelloWorld obj = (HelloWorld) context.getBean("helloWorld");

obj.getMessage();

}

}

Usually developers name this file as **Beans.xml**, but you are independent to choose any name you like. You have to make sure that this file is available in CLASSPATH and use the same name in the main application while creating an application context as shown in MainApp.java file.

The Beans.xml is used to assign unique IDs to different beans and to control the creation of objects with different values without impacting any of the Spring source files. For example, using the following file you can pass any value for "message" variable and you can print different values of message without impacting HelloWorld.java and MainApp.java files. Let us see how it works −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "helloWorld" class = "com.tv.HelloWorld">

<property name = "message" value = "Hello World!"/>

</bean>

</beans>

Spring Configuration Metadata

Spring IoC container is totally decoupled from the format in which this configuration metadata is actually written. Following are the three important methods to provide configuration metadata to the Spring Container −

* XML based configuration file.
* Annotation-based configuration
* Java-based configuration

You already have seen how XML-based configuration metadata is provided to the container, but let us see another sample of XML-based configuration file with different bean definitions including lazy initialization, initialization method, and destruction method −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<!-- A simple bean definition -->

<bean id = "..." class = "...">

<!-- collaborators and configuration for this bean go here -->

</bean>

<!-- A bean definition with lazy init set on -->

<bean id = "..." class = "..." lazy-init = "true">

<!-- collaborators and configuration for this bean go here -->

</bean>

<!-- A bean definition with initialization method -->

<bean id = "..." class = "..." init-method = "...">

<!-- collaborators and configuration for this bean go here -->

</bean>

<!-- A bean definition with destruction method -->

<bean id = "..." class = "..." destroy-method = "...">

<!-- collaborators and configuration for this bean go here -->

</bean>

<!-- more bean definitions go here -->

</beans>

You can check [Spring Hello World Example](https://www.tutorialspoint.com/spring/spring_hello_world_example.htm) to understand how to define, configure and create Spring Beans.

We will discuss about Annotation Based Configuration in a separate chapter. It is intentionally discussed in a separate chapter as we want you to grasp a few other important Spring concepts, before you start programming with Spring Dependency Injection with Annotations.

# Bean Definition

Bean definition contains the information called **configuration metadata**, which is needed for the container to know the following −

* How to create a bean
* Bean's lifecycle details
* Bean's dependencies

All the above configuration metadata translates into a set of the following properties that make up each bean definition.

|  |  |
| --- | --- |
| **Sr.No.** | **Properties & Description** |
| 1 | **class**  This attribute is mandatory and specifies the bean class to be used to create the bean. |
| 2 | **name**  This attribute specifies the bean identifier uniquely. In XMLbased configuration metadata, you use the id and/or name attributes to specify the bean identifier(s). |
| 3 | **scope**  This attribute specifies the scope of the objects created from a particular bean definition and it will be discussed in bean scopes chapter. |
| 4 | **constructor-arg**  This is used to inject the dependencies and will be discussed in subsequent chapters. |
| 5 | **properties**  This is used to inject the dependencies and will be discussed in subsequent chapters. |
| 6 | **autowiring mode**  This is used to inject the dependencies and will be discussed in subsequent chapters. |
| 7 | **lazy-initialization mode**  A lazy-initialized bean tells the IoC container to create a bean instance when it is first requested, rather than at the startup. |
| 8 | **initialization method**  A callback to be called just after all necessary properties on the bean have been set by the container. It will be discussed in bean life cycle chapter. |
| 9 | **destruction method**  A callback to be used when the container containing the bean is destroyed. It will be discussed in bean life cycle chapter. |

# Bean Scopes

When defining a <bean> you have the option of declaring a scope for that bean. For example, to force Spring to produce a new bean instance each time one is needed, you should declare the bean's scope attribute to be **prototype**. Similarly, if you want Spring to return the same bean instance each time one is needed, you should declare the bean's scope attribute to be **singleton**.

The Spring Framework supports the following five scopes, three of which are available only if you use a web-aware ApplicationContext.

|  |  |
| --- | --- |
| **Sr.No.** | **Scope & Description** |
| 1 | **singleton**  This scopes the bean definition to a single instance per Spring IoC container (default). |
| 2 | **prototype**  This scopes a single bean definition to have any number of object instances. |
| 3 | **request**  This scopes a bean definition to an HTTP request. Only valid in the context of a web-aware Spring ApplicationContext. |
| 4 | **session**  This scopes a bean definition to an HTTP session. Only valid in the context of a web-aware Spring ApplicationContext. |
| 5 | **global-session**  This scopes a bean definition to a global HTTP session. Only valid in the context of a web-aware Spring ApplicationContext. |

In this chapter, we will discuss about the first two scopes and the remaining three will be discussed when we discuss about web-aware Spring ApplicationContext.

## The singleton scope

If a scope is set to singleton, the Spring IoC container creates exactly one instance of the object defined by that bean definition. This single instance is stored in a cache of such singleton beans, and all subsequent requests and references for that named bean return the cached object.

The default scope is always singleton. However, when you need one and only one instance of a bean, you can set the **scope**property to **singleton** in the bean configuration file, as shown in the following code snippet −

<!-- A bean definition with singleton scope -->

<bean id = "..." class = "..." scope = "singleton">

<!-- collaborators and configuration for this bean go here -->

</bean>

### Example

Let us have a working Eclipse IDE in place and take the following steps to create a Spring application −

|  |  |
| --- | --- |
| **Steps** | **Description** |
| 1 | Create a project with a name *SpringExample* and create a package *com.tutorialspoint* under the **src** folder in the created project. |
| 2 | Add required Spring libraries using *Add External JARs* option as explained in the *Spring Hello World Example* chapter. |
| 3 | Create Java classes *HelloWorld* and *MainApp* under the *com.tutorialspoint*package. |
| 4 | Create Beans configuration file *Beans.xml* under the **src** folder. |
| 5 | The final step is to create the content of all the Java files and Bean Configuration file and run the application as explained below. |

Here is the content of **HelloWorld.java** file −

package com.tutorialspoint;

public class HelloWorld {

private String message;

public void setMessage(String message){

this.message = message;

}

public void getMessage(){

System.out.println("Your Message : " + message);

}

}

Following is the content of the **MainApp.java** file −

package com.tutorialspoint;

import org.springframework.context.ApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class MainApp {

public static void main(String[] args) {

ApplicationContext context = new ClassPathXmlApplicationContext("Beans.xml");

HelloWorld objA = (HelloWorld) context.getBean("helloWorld");

objA.setMessage("I'm object A");

objA.getMessage();

HelloWorld objB = (HelloWorld) context.getBean("helloWorld");

objB.getMessage();

}

}

Following is the configuration file **Beans.xml** required for singleton scope −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "helloWorld" class = "com.tutorialspoint.HelloWorld" scope = "singleton">

</bean>

</beans>

Once you are done creating the source and bean configuration files, let us run the application. If everything is fine with your application, it will print the following message −

Your Message : I'm object A

Your Message : I'm object A

## The prototype scope

If the scope is set to prototype, the Spring IoC container creates a new bean instance of the object every time a request for that specific bean is made. As a rule, use the prototype scope for all state-full beans and the singleton scope for stateless beans.

To define a prototype scope, you can set the **scope** property to **prototype** in the bean configuration file, as shown in the following code snippet −

<!-- A bean definition with prototype scope -->

<bean id = "..." class = "..." scope = "prototype">

<!-- collaborators and configuration for this bean go here -->

</bean>

### Example

Let us have working Eclipse IDE in place and follow the following steps to create a Spring application −

|  |  |
| --- | --- |
| **Steps** | **Description** |
| 1 | Create a project with a name *SpringExample* and create a package *com.tutorialspoint* under the **src** folder in the created project. |
| 2 | Add required Spring libraries using *Add External JARs* option as explained in the *Spring Hello World Example* chapter. |
| 3 | Create Java classes *HelloWorld* and *MainApp* under the *com.tutorialspoint*package. |
| 4 | Create Beans configuration file *Beans.xml* under the **src** folder. |
| 5 | The final step is to create the content of all the Java files and Bean Configuration file and run the application as explained below. |

Here is the content of **HelloWorld.java** file

package com.tutorialspoint;

public class HelloWorld {

private String message;

public void setMessage(String message){

this.message = message;

}

public void getMessage(){

System.out.println("Your Message : " + message);

}

}

Following is the content of the **MainApp.java** file −

package com.tutorialspoint;

import org.springframework.context.ApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class MainApp {

public static void main(String[] args) {

ApplicationContext context = new ClassPathXmlApplicationContext("Beans.xml");

HelloWorld objA = (HelloWorld) context.getBean("helloWorld");

objA.setMessage("I'm object A");

objA.getMessage();

HelloWorld objB = (HelloWorld) context.getBean("helloWorld");

objB.getMessage();

}

}

Following is the configuration file **Beans.xml** required for prototype scope −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "helloWorld" class = "com.tutorialspoint.HelloWorld" scope = "prototype">

</bean>

</beans>

Once you are done creating the source and bean configuration files, let us run the application. If everything is fine with your application, it will print the following message −

Your Message : I'm object A

Your Message : null

# Bean Life Cycle

The life cycle of a Spring bean is easy to understand. When a bean is instantiated, it may be required to perform some initialization to get it into a usable state. Similarly, when the bean is no longer required and is removed from the container, some cleanup may be required.

Though, there are lists of the activities that take place behind the scene between the time of bean Instantiation and its destruction, this chapter will discuss only two important bean life cycle callback methods, which are required at the time of bean initialization and its destruction.

To define setup and teardown for a bean, we simply declare the <bean> with **initmethod** and/or **destroy-method** parameters. The init-method attribute specifies a method that is to be called on the bean immediately upon instantiation. Similarly, destroymethod specifies a method that is called just before a bean is removed from the container.

## Initialization callbacks

The org.springframework.beans.factory.InitializingBean interface specifies a single method −

void afterPropertiesSet() throws Exception;

Thus, you can simply implement the above interface and initialization work can be done inside afterPropertiesSet() method as follows −

public class ExampleBean implements InitializingBean {

public void afterPropertiesSet() {

// do some initialization work

}

}

In the case of XML-based configuration metadata, you can use the **init-method** attribute to specify the name of the method that has a void no-argument signature. For example −

<bean id = "exampleBean" class = "examples.ExampleBean" init-method = "init"/>

Following is the class definition −

public class ExampleBean {

public void init() {

// do some initialization work

}

}

## Destruction callbacks

The *org.springframework.beans.factory.DisposableBean* interface specifies a single method −

void destroy() throws Exception;

Thus, you can simply implement the above interface and finalization work can be done inside destroy() method as follows −

public class ExampleBean implements DisposableBean {

public void destroy() {

// do some destruction work

}

}

In the case of XML-based configuration metadata, you can use the **destroy-method** attribute to specify the name of the method that has a void no-argument signature. For example −

<bean id = "exampleBean" class = "examples.ExampleBean" destroy-method = "destroy"/>

Following is the class definition −

public class ExampleBean {

public void destroy() {

// do some destruction work

}

}

If you are using Spring's IoC container in a non-web application environment; for example, in a rich client desktop environment, you register a shutdown hook with the JVM. Doing so ensures a graceful shutdown and calls the relevant destroy methods on your singleton beans so that all resources are released.

It is recommended that you do not use the InitializingBean or DisposableBean callbacks, because XML configuration gives much flexibility in terms of naming your method.

### Example

Let us have a working Eclipse IDE in place and take the following steps to create a Spring application −

|  |  |
| --- | --- |
| **Steps** | **Description** |
| 1 | Create a project with a name *SpringExample* and create a package *com.tutorialspoint* under the **src** folder in the created project. |
| 2 | Add required Spring libraries using *Add External JARs* option as explained in the *Spring Hello World Example* chapter. |
| 3 | Create Java classes *HelloWorld* and *MainApp* under the *com.tutorialspoint*package. |
| 4 | Create Beans configuration file *Beans.xml* under the **src** folder. |
| 5 | The final step is to create the content of all the Java files and Bean Configuration file and run the application as explained below. |

Here is the content of **HelloWorld.java** file −

package com.tutorialspoint;

public class HelloWorld {

private String message;

public void setMessage(String message){

this.message = message;

}

public void getMessage(){

System.out.println("Your Message : " + message);

}

public void init(){

System.out.println("Bean is going through init.");

}

public void destroy() {

System.out.println("Bean will destroy now.");

}

}

Following is the content of the **MainApp.java** file. Here you need to register a shutdown hook **registerShutdownHook()** method that is declared on the AbstractApplicationContext class. This will ensure a graceful shutdown and call the relevant destroy methods.

package com.tutorialspoint;

import org.springframework.context.support.AbstractApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class MainApp {

public static void main(String[] args) {

AbstractApplicationContext context = new ClassPathXmlApplicationContext("Beans.xml");

HelloWorld obj = (HelloWorld) context.getBean("helloWorld");

obj.getMessage();

context.registerShutdownHook();

}

}

Following is the configuration file **Beans.xml** required for init and destroy methods −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "helloWorld" class = "com.tutorialspoint.HelloWorld" init-method = "init"

destroy-method = "destroy">

<property name = "message" value = "Hello World!"/>

</bean>

</beans>

Once you are done creating the source and bean configuration files, let us run the application. If everything is fine with your application, it will print the following message −

Bean is going through init.

Your Message : Hello World!

Bean will destroy now.

## Default initialization and destroy methods

If you have too many beans having initialization and/or destroy methods with the same name, you don't need to declare **init-method** and **destroy-method** on each individual bean. Instead, the framework provides the flexibility to configure such situation using **default-init-method** and **default-destroy-method** attributes on the <beans> element as follows −

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd"

default-init-method = "init"

default-destroy-method = "destroy">

<bean id = "..." class = "...">

<!-- collaborators and configuration for this bean go here -->

</bean>

</beans>

# Bean Definition Inheritance

## Example

Let us have a working Eclipse IDE in place and take the following steps to create a Spring application −

|  |  |
| --- | --- |
| **Steps** | **Description** |
| 1 | Create a project with a name *SpringExample* and create a package *com.tutorialspoint* under the **src** folder in the created project. |
| 2 | Add required Spring libraries using *Add External JARs* option as explained in the *Spring Hello World Example* chapter. |
| 3 | Create Java classes *HelloWorld*, *HelloIndia* and *MainApp* under the *com.tutorialspoint* package. |
| 4 | Create Beans configuration file *Beans.xml* under the **src** folder. |
| 5 | The final step is to create the content of all the Java files and Bean Configuration file and run the application as explained below. |

Following is the configuration file **Beans.xml** where we defined "helloWorld" bean which has two properties *message1* and *message2*. Next "helloIndia" bean has been defined as a child of "helloWorld" bean by using **parent**attribute. The child bean inherits *message2* property as is, and overrides *message1* property and introduces one more property *message3*.

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "helloWorld" class = "com.tutorialspoint.HelloWorld">

<property name = "message1" value = "Hello World!"/>

<property name = "message2" value = "Hello Second World!"/>

</bean>

<bean id ="helloIndia" class = "com.tutorialspoint.HelloIndia" parent = "helloWorld">

<property name = "message1" value = "Hello India!"/>

<property name = "message3" value = "Namaste India!"/>

</bean>

</beans>

Here is the content of **HelloWorld.java** file −

package com.tutorialspoint;

public class HelloWorld {

private String message1;

private String message2;

public void setMessage1(String message){

this.message1 = message;

}

public void setMessage2(String message){

this.message2 = message;

}

public void getMessage1(){

System.out.println("World Message1 : " + message1);

}

public void getMessage2(){

System.out.println("World Message2 : " + message2);

}

}

Here is the content of **HelloIndia.java** file −

package com.tutorialspoint;

public class HelloIndia {

private String message1;

private String message2;

private String message3;

public void setMessage1(String message){

this.message1 = message;

}

public void setMessage2(String message){

this.message2 = message;

}

public void setMessage3(String message){

this.message3 = message;

}

public void getMessage1(){

System.out.println("India Message1 : " + message1);

}

public void getMessage2(){

System.out.println("India Message2 : " + message2);

}

public void getMessage3(){

System.out.println("India Message3 : " + message3);

}

}

Following is the content of the **MainApp.java** file −

package com.tutorialspoint;

import org.springframework.context.ApplicationContext;

import org.springframework.context.support.ClassPathXmlApplicationContext;

public class MainApp {

public static void main(String[] args) {

ApplicationContext context = new ClassPathXmlApplicationContext("Beans.xml");

HelloWorld objA = (HelloWorld) context.getBean("helloWorld");

objA.getMessage1();

objA.getMessage2();

HelloIndia objB = (HelloIndia) context.getBean("helloIndia");

objB.getMessage1();

objB.getMessage2();

objB.getMessage3();

}

}

Once you are done creating the source and bean configuration files, let us run the application. If everything is fine with your application, it will print the following message −

World Message1 : Hello World!

World Message2 : Hello Second World!

India Message1 : Hello India!

India Message2 : Hello Second World!

India Message3 : Namaste India!

If you observed here, we did not pass message2 while creating "helloIndia" bean, but it got passed because of Bean Definition Inheritance.

## Bean Definition Template

You can create a Bean definition template, which can be used by other child bean definitions without putting much effort. While defining a Bean Definition Template, you should not specify the **class** attribute and should specify **abstract** attribute and should specify the abstract attribute with a value of **true** as shown in the following code snippet −

<?xml version = "1.0" encoding = "UTF-8"?>

<beans xmlns = "http://www.springframework.org/schema/beans"

xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"

xsi:schemaLocation = "http://www.springframework.org/schema/beans

http://www.springframework.org/schema/beans/spring-beans-3.0.xsd">

<bean id = "beanTeamplate" abstract = "true">

<property name = "message1" value = "Hello World!"/>

<property name = "message2" value = "Hello Second World!"/>

<property name = "message3" value = "Namaste India!"/>

</bean>

<bean id = "helloIndia" class = "com.tutorialspoint.HelloIndia" parent = "beanTeamplate">

<property name = "message1" value = "Hello India!"/>

<property name = "message3" value = "Namaste India!"/>

</bean>

</beans>

The parent bean cannot be instantiated on its own because it is incomplete, and it is also explicitly marked as *abstract*. When a definition is abstract like this, it is usable only as a pure template bean definition that serves as a parent definition for child definitions.